GIET UNIVERSITY, GUNUPUR – 765022

RD19MSC016

Roll No: | | | | | | |

Total Number of Pages : 2 AR-19 M.Sc

M.Sc 1[ST] SEMESTER REGULAR EXAMINATIONS, NOV/DEC 2019-20

CHPC102-INORGANIC CHEMISTRY – I

Time: 3 Hours Max Marks: 80

The figures in the right hand margin indicate marks.

SECTION–A

Q.1. Answer *Any Four* of the following: [4 × 4 = 16]

a. What are the factors favoring the formation of covalent bond? [4.0]

b. Discuss the shapes of the XeO_3, BrF_3, PCl_5, and SF_6 molecules. [4.0]

c. Discuss the short comings of valence bond theory for co-ordination compounds. [4.0]

d. Discuss the Tanabe-Sugano energy diagram for d^2 configuration. [4.0]

e. What are the Hund's rules for energy ordering of the terms of a configuration? [4.0]

f. Explain the term artificial radioactivity. Give the nuclear reactions induced by neutron, proton, and α-particle. [4.0]

OR

Q.2. Answer *All* questions from the following [8 × 2 = 16]

a. Explain why chlorine atom shows the covalency of 1, 3, 5, and 7 in spite of the presence of one unpaired electron. [2.0]

b. What is the expected geometry for the following types of hybridization: sp, sp^2, sp^3, dsp^2, dsp^3, and d^2sp^3 hybridizations? [2.0]

c. State the factors affecting the value of crystal field splitting. [2.0]

d. Discuss the color and magnetic properties of the co-ordination compounds. [2.0]

e. Differentiate between the terms, states, and microstates. [2.0]

f. Explain the term Charge transfer spectra with a suitable example. [2.0]

g. Count rate meter is used to measure the initial activity of 4750 counts/min and five minutes later it shows 2700 counts/min. Find the decay constant and half-life of the sample. [2.0]

h. Explain the differences between chemical and nuclear reactions. [2.0]

SECTION–B

Answer *All* Questions: [4 × 16 = 64]

Q.3.

a. i. State a qualitative account of valence bond theory of formation of hydrogen molecule. [8.0]

ii. Discuss the necessary conditions to be fulfilled by the atomic orbitals to participate in the formation of molecular orbitals. [4.0]

iii. Write a note on the valence shell electron pain repulsion theory. [4.0]

OR

b. i. Describe the important features of molecular orbital theory. [4.0]

ii. Write down the comparison between bonding and antibonding molecular orbitals. [7.0]

iii. Draw the molecular orbital energy level diagram of F_2 and NO. [5.0]

Q.4.

a. i. Discuss the important differences between valence bond theory and crystal field theory. [6.0]

ii. Discuss the splitting of d-orbitals in the case of octahedral, tetrahedral, and square planar complexes. [7.0]

iii. Discuss the difference between inner orbital and outer orbital complexes with suitable examples. [3.0]

OR

b. i. Describe the bonding of $[Fe(H_2O)_6]^{3+}$ and $[Fe(CN)_6]^{3-}$ complexes based on valence bond theory and crystal field theory. [8.0]

ii. Define crystal field stabilization energy and calculate its value in d^5 low spin and high spin octahedral systems. [4.0]

iii. Discuss the sigma and pi metal–ligand bonding in transition metal complexes with reference to tetrahedral systems. [4.0]

Q.5.

a. i. Derive the possible terms for a p^2 configuration. [6.0]

ii. Compare between the ferromagnetism, ferrimagnetism, and anti-ferromagnetism. [6.0]

iii. Discuss the L–S coupling for a p^2 configuration with schematic diagrams. [4.0]

OR

b. i. Draw the Orgel diagram for both d^5 weak and strong field complexes and discuss its important features. [7.0]

ii. Construct a correlation diagram for a d^2 configuration under octahedral crystal field and discuss its important features. [4.0]

iii. Define the term magnetic susceptibility and discuss the method to measure it. [5.0]

Q.6.

a. i. Write notes on health hazards of radiations and carbon dating techniques. [6.0]

ii. Discuss the nuclear fission and nuclear fusion with suitable examples. [6.0]

iii. Calculate the binding energy per nucleon in Joules unit for helium atom. [4.0]

OR

b. i. Derive the expression of decay constant. [4.0]

ii. Write down the uses of radio isotopes for dating, medicine agriculture, and industry. [6.0]

iii. Compare the properties of α, β, and γ rays. [6.0]

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